

## **DRAFT**

# Site Gas Sampling and Analysis Plan Crestmore Disposal Site Bloomington/San Bernardino County



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# 1. Introduction

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The California Integrated Waste Management Board (CIWMB) Closed, Illegal and Abandoned Site (CIA) program investigates solid waste disposal sites and provides site data and documentation to quantify requirements for both enforcement and potential clean-up activities by the CIWMB Solid Waste Cleanup Program (AB 2136). Depending on the types of wastes at the site, landfill gas sampling may be necessary to determine gas concentrations and lateral gas migration for the purpose of scoping enforcement and remediation work or referral to the local Air Quality Management District (AQMD).

Typically, landfill gas contains Methane gas, Oxygen, Nitrogen, Carbon Dioxide, Hydrogen Sulfide and Non-methane Organic Carbons (trace gasses) (NMOC's). A landfill gas characterization study performed by the CIWMB, indicated that the most common NMOCs for landfill gas include: Benzene, Ethylbenzene, Toluene, Vinyl Chloride, Dichloromethane, Trichloroethylene, 1,2, -cis-Dichloroethylene and Tetrachloroethylene.

The Crestmore Disposal Site was owned and operated by the County of San Bernardino between 1955 and 1966 when it stopped accepting waste. The facility was a class III landfill pursuant to Title 23, Article 5, CCR.

The site is located southeast of the intersection of Maple Avenue and Jurupa Avenue in the community of Crestmore, approximately 2.5 miles south of Interstate 10. Specifically, the site occupies a portion of the N1/2 of the NE1/4 Sec. 33, T1S, R5W, SBM (Norcal, Oct. 1996).

The facility was permitted to accept Class III wastes including residential, demolition, commercial refuse, and non-decomposable inert solids. Demolition wastes included mixtures of concrete, asphalt, wood, steel, brick and block. Crestmore sanitary landfill is located on a 15-acre site which approximately 1-acre was used for refuse disposal. The Solid Waste Partnership Strategic Implementation Plan indicates that the landfill has an estimated 133,500 cubic yards of refuse in place. An additional 65,450 cubic yards of waste may be present in an adjacent filled quarry area. (Norcal, Oct. 1996)

## 1.1. Site Location and Description

The Crestmore Disposal Site is an old municipal solid waste landfill, owned by the County of San Bernardino Solid Waste Division. Before it closed in 1966, NorCal/San Bernardino Inc operated the Crestmore disposal site. The site is located in a portion of the northeast quarter of Section 33, Township 1 South, Range 5 West, San Bernardino Baseline and Meridian, San Bernardino County, California. It is approximately 7km southwest of the City of Rialto, near the southwest corner of the intersection of Maple Avenue and Jurupa Avenue.



**Figure 1.** Area Map of the Crestmore Disposal Site

**Figure 2.** Site Map

## 1.2. Project Background

The Remediation, Closure & Technical Services (RCTS) Branch, was requested by the San Bernardino County Local Enforcement Agency (LEA) to perform gas sampling and analysis at the Crestmore Landfill to determine appropriate remedial measures necessary to protect public health and safety and the environment from possible migrating landfill gas.

## 1.3. Project Purpose

The objective of the investigation is to identify potential gas migration paths from the landfill to adjacent structures and provide gas migration data that will allow the LEA to potentially request assistance from the AB 2136 program to install a gas control system to prevent gas migration into the private residences adjacent to the landfill. The site gas migration data will provide data from the currently in-place groundwater monitoring wells, and 6 new multi-level gas monitoring probes placed at strategic positions between the property boundary of the landfill and the residences that may be affected by gas migration.

## 1.4. Responsible Agency

The CIWMB will be responsible for preparing the gas sampling plan, performing the sampling, reviewing the sample report, and providing the sampling report to the LEA for further action. CIWMB will also prepare a site investigation report and place both the sampling report and site

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investigation report in CIWMB Files and update the site's Solid Waste Information System (SWIS) database.

## 1.5. Project Organization

The site investigation and sampling and analysis plan and report preparation will be conducted by CIWMB CIA Section Staff. The CIA Section Senior Engineer, Mr. Glenn K. Young, P.E. will oversee preparation of the gas sampling and analysis plan, conducting gas sampling and analysis activities and preparation of the draft and final sampling and analysis report. The CIWMB's Health and Safety Section will be responsible for preparing a site specific health and safety plan and monitor onsite health and safety issues. As lead on the project, Mr. Young may be reached at the California Integrated Waste Management Board 1001 "I" Street, P.O. Box 4025, Sacramento, CA 95812-4025 or by calling (916) 341-6696. The CIWMB will use its own gas sampling equipment and obtain Tedlar Bags or Summa Cannisters, labels, chain-of-custody forms and shipping containers from its environmental laboratory services contractor, ExcelChem, Inc.

CIWMB will be responsible for determining gas probe locations, mapping sampling locations, sample packaging, shipping, and analysis, and producing a gas sampling and analysis report.

### **Previous Investigations:**

The site was closed by the RWQCB who conducted a Water SWAT in 1991 assigned a Rank 14. Three down gradient wells were installed (CMGW-1, CMGW-2, CMGW-3) as part of the SWAT. Two more wells (CMGW-4 and CMGW-5) were installed fall of 1994 and first sampled 1995 as part of the Enhanced Article 5 Detection Monitoring Program. Waste disposed of at the site included inert and mixed municipal solid waste. No burning of waste was known to have taken place.

IT Corporation in 1993 and EMCON for Geologic Associates(1995) performed site investigations and installed the water monitoring wells that were completed in 1991 and 1994. In the fall of 1994 soil-pore gas monitoring probes CMPG1 through CMPG-3 and CMPG-4 thru CMPG-7 were completed February 1997 at the request of San Bernadino County Solid Waste. VOC's were detected from testing of the wells

The LEA prepared a Closed, Illegal and Abandoned site identification form on September 27, 2000. In summary the investigation concluded that the disposal area is 1 acre in size. Prior to the site being a landfill, it was a limestone quarry originally known as Little Hill Quarry. The original mine excavation was oblong in shape with the longest axis oriented northwest to southeast and extending from Jurupa Avenue on the north to the Southern California Edison utility easement on the south. The quarry and disposal area measured to about 300 feet in diameter and excavated to about 150 feet. The site was operated from 1955 to 1966. The depth of the waste goes as deep as 150 ft in the deepest portion of the pit

A field visit to the site by IWMB staff was conducted on May 15, 2001 with the LEA. The following observations were noted:

- a) Differential settlement had occurred

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- b) Groundwater monitoring wells were in place but not currently monitored
  - c) Residential housing was adjacent to the site on the north, east, and south.
  - d) There were no Landfill gas monitoring probes along the property boundary on the east and northern sides.

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## 2. Project Objective

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### 2.1. Data Collection

Gas sampling will be conducted using both field screening equipment, a GMI Gas Detection instrument (capable of measuring methane, carbon dioxide, oxygen, hydrogen sulfide and organic vapor up to 1000 ppm) and gas sample collection containers (Summa Cannisters and Tedlar Bags) provided by CIWMB's Environmental Laboratory Accreditation Program (ELAP)-certified laboratory contractor. Field screening equipment will be conducted in accordance with the gas sampling and analysis plan and sample collection and analysis conducted in accordance with EPA technical order (TO) 15. The CIWMB will use regulatory limits established by both 27 CCR Section 20917 and local Air Quality Management District (AQMD) rules.

### 2.2. Project Tasks

A Phase I Investigation will be conducted to obtain the following information and data, prior to finalizing objectives for the gas sampling and analysis plan:

- a) Historical Aerial Photograph research to determine the aerial (horizontal) extent of the landfill and location of landfill with respect to on-site structures. Aerial of the original Gravel pit to determine the actual extent of the pit and the possible placement and limits of it.
- b) As-built drawings for site utility systems such as gas, electric, sewage, water, cable TV, storm drains, etc. (county planning offices).
- c) Copy of operating permits issued by applicable agencies (AQMD).
- d) Copy of Waste Discharge Requirements (WDRs?) issued by the RWQCB, including data and information from groundwater monitoring activities.
- e) Obtain and review prior site investigation reports to develop a strategy for the placement of the new probes given the geology of the site.

Gas sampling locations will include the newly constructed probes, on-site structures, and utility penetrations. Since landfill gas production typically follows a temporal cycle (normally associated with local hydrologic conditions), monthly sampling should be performed after the probes are installed. Most areas will be screened using the GMI Landfill Gas Detection equipment. If gas concentrations exceed 1% or 10,000 ppm, a gas sample will be obtained using either a Tedlar Bag or Summa Canister.

Collected samples will be analyzed for typical landfill gas constituents such as methane, carbon dioxide, nitrogen and hydrogen sulfide. Trace gases (also referred to as Non-methane organic compounds NMOC) will be analyzed for a suite of Volatile Organic Compounds including trichloroethylene, perchloroethylene, dichloromethane, tetrachloroethane, benzene, toluene, xylene and ethylbenzene.

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Sample collection and analysis procedures for landfill gas will follow T.O. 15 requirements as outlined in this gas sampling and analysis plan. Analysis for all gas samples will be performed by IWMB's contract laboratory, ExcelChem.

A non-intrusive investigation, e.g. electromagnetic survey (EM) or ground penetrating radar (GPR) survey, may need to be performed to located underground structures or define waste fill areas in comparison to native areas. A map showing anamolies and interpretations will be produced from this investigation and included in the final site investigation report.

An intrusive investigation, e.g. borings, may be performed, if adequate maps defining the landfill horizontal extents cannot be found. The results of this intrusive investigation will be used to determine if waste reconfiguration is necessary to eliminate pathways between the landfill and above and below ground structures. If it is found that structures are constructed over waste fill areas, foundations will be assessed for differential settlement to determine if potential foundation breaches exist which could damage membrane liners installed to prevent gas migration. Prior to trenching or boring, Underground Service Alert (USA) will be contacted to conduct a utility survey and mark all potential below-grade utilities. A map showing trench locations and trench logs will be included with the final site investigation report.

Upon receipt of laboratory analysis reports for collected samples, IWMB will compile and correlate gas constituent data and prepared a report summarizing the results. IWMB will also provide a comparison of the results to regulatory thresholds and provide recommendations for remedial measures required to obtain compliance with applicable regulations.

## 2.3. Expected Data

Landfill gas constituent concentration data obtained during this investigation will be evaluated to determine if additional sampling is necessary. Additional sampling may be performed if it is found that specific constituent levels exceed regulatory thresholds specified by 27 CCR Section 20925, e.g. 1.25% in structures of 5% in perimeter monitoring probes. Based on information known about the site the following is expected:

- a) Average landfill gas production within the fill area ranges from 16%-68% based on past readings.
- b) Landfill gas constitutents include methane, carbon dioxide, nitrogen, hydrogen sulfide and trace VOCs (VC, TCE, PCE, BTEX)
- c) Soil gas monitoring probes exceed 5% regulatory limit requiring corrective action
- d) Structures may be constructed on top of waste (direct conduits between landfill and structures
- e) Subsurface utilities and structures may provide potential migration paths to structures
- f) The first 60 feet of the site is a gravel lense, which provides an avenue for gas migration towards he residences.

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## 3. Gas Sampling Plan

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This gas sampling plan is intended to document the procedural and analytical requirements for this and any subsequent sampling events performed to collect gas samples and to characterize areas exceeding regulatory thresholds. This plan was compiled after reviewing the US Environmental Protection Agency's, Region 9, guidance document "Instructions for the One-time Sampling Event Sampling and Analysis Plan" dated March 1998.

### 3.1. Sampling Methodology

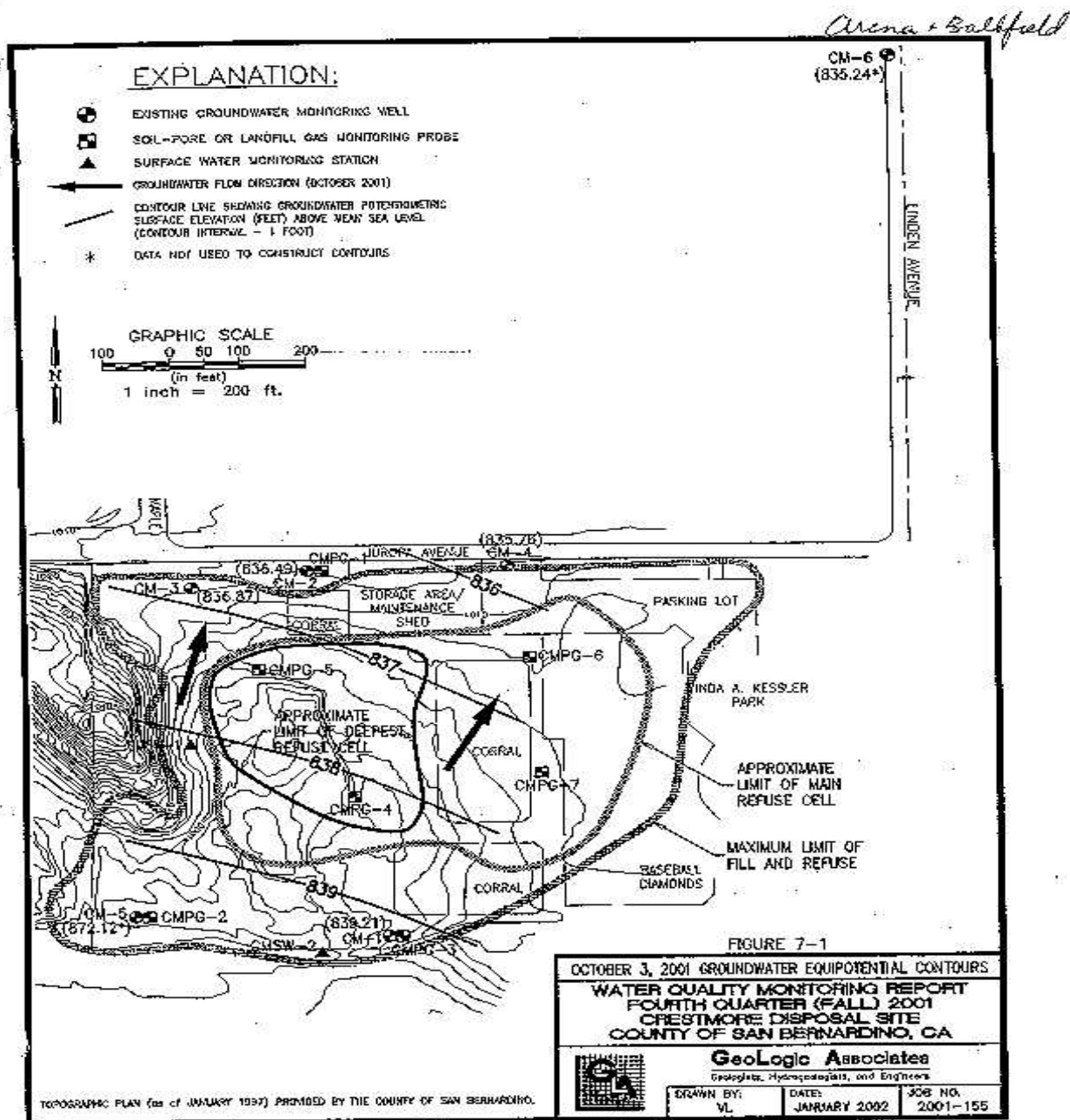
Discrete gas sampling will be performed at locations where gas screening indicates the presence of landfill gas, i.e. percent indications. Sampling locations will be predetermined based on available site information and data, although authoritative sampling may be performed and authoritative sampling locations documented in the final SAP report. The authoritative protocol allows the investigator the flexibility to move sampling locations, as necessary, to accommodate unforeseen field conditions. The following outline describes the proposed sampling:

- Gas sampling at monitoring probes. A total of 7 gas monitoring probes will be screened (if accessible) using the GMI per figure 7.1. Probes exceeding 1% gas will be connected to a pneumatic sampling pump and Tedlar Bag and a sample collected for laboratory analysis.
- 3 new 150ft gas wells with 4 multi-depth probes screened at intervals of (5-30ft), (35-65 ft), (70-105 ft), (110-150 ft) and (5ft) Bentonite unscreened sections in-between screened sections will be constructed on the north-east and east side of the site. Each probe will be sampled to determine gas concentrations at each depth. The horizontal extent of the waste is not clearly defined so if a borehole hits varied waste from 1-2ft, the drilling will continue. If the waste appears to be a cell more than 2ft then authoritative protocol will commence and a new location will be decided. The Original hole will be abandoned and sealed with 95% bentonite grout. If gas concentration in a probe exceeds 1% BV a sample will be taken. Probes exceeding 1% gas will be connected to a pneumatic sampling pump and Tedlar Bag and a sample collected for laboratory analysis.
- Gas sampling of utility corridors. Utility corridors identified by Underground Service Alert will be screened using the GMI Gas Instrument. If greater than 5000 ppm is detected, a sample will be taken using a pneumatic sampling pump and Tedlar Bag.
- Gas sampling of enclosed structures or utility penetrations in foundations. Confined spaces will be screened using a GMI Gas Instrument. Concentrations in confined spaces exceeding 5000 ppm will be sampled using a Tedlar bag and pneumatic sampling pump.

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Each sample will be collected using decontaminated sampling equipment, Tedlar Bags and Summa Canisters. IWMB will provide magnahelic gages, GMI instruments and clean Tedlar Bags. ExcelChem will provide uncontaminated Summa Canisters (provided under vacuum). However Summa canisters will not be used if screening indicates concentrations of H<sub>2</sub>S in excess of 15ppm.

# Existing Probe Locations Figure 7.1





**New Proposed Probe Locations**

Probes A,B,andC are 150ft  
Multi-Depth

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## 3.2. Gas Sampling Equipment

The following equipment and supplies will be necessary to perform the sampling

- GMI Gas Detection Instrument
- Tedlar Bags
- Summa Cannisters
- Temperature Gage
- Pressure Gage (Magnahelec Gage)
- Pneumatic Air Sampling Pump
- Digital Camera w/Floppy Disks
- Level C health and safety equipment (Tyvex, tape, respirator with HEPA filter)
- Decontamination equipment (2 ½ gallon sprayer, non-phosphate detergent, disposable brush, paper towels, cotton towels, polyethylene sheeting)
- Gas monitoring data log sheet
- First aid kit
- Chain of custody forms and seals
- Mailing labels and markers
- Cooler and ice or blue ice
- Packing and duct tape
- Tool Kit (screwdriver, wrench, pliers)
- Laptop computer (download data)

## 3.3. Gas Sampling Procedures

Gas samples will be collected using pneumatic air pumps, GMI gas instruments, Tedlar Bags and Summa Cannisters. All sampling equipment and containers will be decontaminated prior to use. Samples will be taken from gas monitoring probe sampling cocks or Tygon Tubing, Extraction Well sampling ports or confined spaces. All sampling locations will be screened with a GMI Gas Instrument Prior to obtaining sampling for analysis.

After each sample is collected it will be labeled, logged on the chain-of-custody document, sealed, and stored in an ice chest that is cooled to 4 degrees Fahrenheit.

At the completion of sampling activities, IWMB staff will deliver the selected samples to a State of California certified ELAP accredited laboratory for analyses using strict chain-of-custody protocols.

## 3.4. Gas Sample Locations

Although sampling locations are proposed in Figure 7.1 exact gas sampling locations will be determined in the field based on gas screening using a GMI gas instrument. Locations where gas samples are obtained will be recorded in the field logbook and annotated on a site map. The map will be provided in a final sample report.

## 3.5. Decontamination Procedures

All equipment that comes into contact with landfill gas will be decontaminated in a predesignated area. Decontamination will consist of operating the sampling equipment with nitrogen or ambient air for 2 minutes to purge residual gas.

## 3.6. Gas Sample Containers and Preservation

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Decontaminated Summa Cannisters and Tedlar Bags will be supplied by the laboratory and will not require decontamination prior to sample collection. No preservative will be added to the containers.

### 3.7. Disposal of Residual Materials

In the process of collecting gas samples at the Newport Terrace Landfill, the CIWMB sampling team will generate different types of potentially contaminated investigation-derived waste (IDW) that may include:

- Used personal protective equipment (PPE)
- Disposable sampling equipment

The U.S. EPA's National Contingency Plan requires management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements to the extent practicable. Used PPE and disposable equipment will be double bagged and placed in municipal refuse dumpster. Any PPE and disposable equipment that is to be disposed of which can still be used will be rendered inoperable before disposal

If hazardous or radioactive material are found during sampling screening activities, appropriate level of notification and response procedures will be implemented in accordance with the Site Specific Health and Safety Plan.

### 3.8. Analytes of Concern

Analytes of concern at this site for Landfill Gas are Methane, Carbon Dioxide, Nitrogen, Hydrogen Sulfide and Trace Gases such as Vinyl Chloride, TCE, PCE, BTEX, etc. (Section 1).

### 3.9. Analytical Procedures

Each sample will be screened for percent combustible gas (calibrated to Methane) using a GMI Gas instrument. Samples will be analyzed using Method TO-15, Total Organics Gas Analysis and Fixed Gasses (Methane).

### 3.10. Anticipated Cost

Based on discussions with ExcelChem Analytical Laboratory the following sampling costs are presented:

EPA METHOD	PARAMETER	UNIT COST	# SAMPLES	COST
TO-15	Total Organics	\$140	20	\$2800
ASTM-1946	Methane	\$110	20	\$2200
With Methane				
			<b>Total</b>	<b>\$5,000</b>

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### 3.11. Field Quality Control

One field duplicate sample will be collected simultaneously with a standard sample from the same source under identical conditions into a separate sample container. The duplicated sample is treated independently of its counterpart in order to assess laboratory performance through comparison of the results.

The duplicate samples will be collected at a random location that demonstrates elevated levels of gas based on field screening results.

### 3.12. Laboratory Quality Control

The analytical laboratory will perform Quality Control (QC). The QC will include project specific QC, method blank results, laboratory control spike, and matrix spike results.

1. Project Specific QC – No project specific QC has been requested by the CIWMB
2. Method Blank Results – A method blank is a laboratory-generated sample that assesses the degree to which laboratory operations and procedures cause false-positive analytical results for the CIWMB samples. The method blank results associated with the samples will be included with the analytical results.
3. Laboratory Control Spike – A Laboratory Control Spike (LCS) is a sample that is spiked with known analyte concentrations, and analyzed at approximately 10 percent of the sample load in order to establish method-specific control limits. The LCS results associated with CIWMB samples will be attached on the LCS and LCS Duplicated Analysis Report.
4. Matrix Spike Results – A matrix spike is a sample that is spiked with known analyte concentrations and analyzed at approximately 10 percent of the sample load in order to establish method-specific control limits. The matrix spike results associated with CIWMB samples will be attached on the Matrix Spike and Matrix Spike Duplicate Analysis Report.
5. Accuracy – Accuracy will be measured by percent recovery as defined by:

$$\% \text{ recovery} = \frac{(\text{measured concentration}) \times 100}{(\text{actual concentration})}$$

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## 4. Documenting and Reporting

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### 4.1. Field Notes

A field logbook will be used to document the vital project and sample information. At a minimum, the following sample information will be recorded:

- Sample location and description
- Site or sample area sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or discrete
- Type of sample (gas)
- Type of sampling equipment used
- Field instrument reading, if applicable
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Preliminary sample descriptions
- Sample preservation
- Sample identification numbers and explanatory code
- Name of recipient laboratory

In addition to the sampling information, the following specific information will also be recorded in the logbook:

- Team members and their responsibilities
- Time of arrival and departure
- Deviations from the sampling plan
- Level of health and safety protection

### 4.2. Photographs

Photographs will be taken at the sampling location and at surrounding areas. The photos will verify information entered in the field logbook. Each photo taken will be written in the logbook with the approximate time, date, and location.

### 4.3. Labeling

All samples collected will be labeled in a clear and precise way for proper identification for tracking in the laboratory. Each sample will reference the sample date, the type of sample and the sample point identification as shown on the pin flag.

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#### 4.4. Chain-of-Custody

A chain-of-custody record will accompany all sample shipments. Shipped samples will have a custody seal placed across the lid of each sample container. All custody seals will be signed and dated.

#### 4.5. Packaging and Shipment

All sample containers will be placed in a strong-outside shipping container and will have the drain plug sealed, if applicable, to prevent melted ice from leaking out of the cooler. If ice is used to cool the samples, the ice will be packed in a double zip-lock bag. Special care will be provided to secure and prevent damage to the sample containers.

#### 4.6. Reporting

Once the analytical results are received and evaluated, IWMB will prepare a sampling report describing the nature of the waste and discuss the analytical results. The CIWMB anticipates submitting the sampling report to the LEA and Newport Terrace Condominiums within 30 days after receipt of the analytical results.